

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, the method comprising:
  - a peeling layer forming step of forming a peeling layer on a first substrate;
  - an insulating film forming step of forming an insulating film on the peeling layer;
  - a fine hole forming step of forming a plurality of fine holes in the insulating film;
  - a film forming step of forming a semiconductor film on the insulating film and in the fine holes;
  - a crystallization step of melting and crystallizing the semiconductor film by a heat treatment to form a crystalline semiconductor film including substantially single-crystalline grains substantially centered on the respective fine holes;
  - an element forming step of forming a semiconductor element by using the crystalline semiconductor film; and
  - a transfer step of causing peeling at the inside and/or the boundary surface of the peeling layer to separate the semiconductor element from the first substrate and transferring the semiconductor element to a second substrate.
2. The method of manufacturing a semiconductor device according to Claim 1, wherein the transfer step comprises:
  - a bonding step of bonding the semiconductor element on the first substrate to the second substrate;
  - a peeling step of applying energy to the peeling layer to cause the peeling at the inside and/or the boundary surface of the peeling layer; and
  - a separation step of separating the first substrate from the second substrate.
3. The method of manufacturing a semiconductor device according to Claim 1, wherein the transfer step comprises:
  - a first bonding step of bonding the semiconductor element on the first substrate to a temporary transfer substrate;
  - a first peeling step of causing the peeling at the inside and/or the boundary surface of the peeling layer;
  - a first separation step of separating the first substrate from the temporary transfer substrate;
  - a second bonding step of bonding the semiconductor element on the temporary transfer substrate to the second substrate; and

a second separation step of separating the temporary transfer substrate from the second substrate.

4. The method of manufacturing a semiconductor device according to Claim 2, wherein the application of energy to the peeling layer is carried out by means of laser irradiation.

5. The method of manufacturing a semiconductor device according to Claim 1, wherein the first substrate has at least one of size, shape and thermal resistance suitable for a semiconductor process capable of processing at least a semiconductor wafer.

6. The method of manufacturing a semiconductor device according to Claim 5, wherein the semiconductor process is an LSI manufacturing process.

7. The method of manufacturing a semiconductor device according to Claim 5, wherein the first substrate has a wafer size.

8. The method of manufacturing a semiconductor device according to Claim 1, wherein the surface roughness of the first substrate ranges from 10  $\mu\text{m}$  to 30  $\mu\text{m}$ .

9. The method of manufacturing a semiconductor device according to Claim 1, wherein in the element forming step, a plurality of the semiconductor elements are formed using one crystalline semiconductor film.

10. The method of manufacturing a semiconductor device according to Claim 9, wherein the plurality of semiconductor elements constitute a unit circuit.

11. The method of manufacturing a semiconductor device according to Claim 1, wherein in the transfer step, only the semiconductor elements that are transfer targets among the plurality of semiconductor elements formed on the first substrate are selectively transferred from the first substrate to the second substrate.

12. The method of manufacturing a semiconductor device according to Claim 11, wherein in the transfer step, the semiconductor elements that are the transfer targets are selected correspondingly to a plurality of the crystalline semiconductor films, respectively.

13. The method of manufacturing a semiconductor device according to Claim 12, the method further comprising a division step of dividing the semiconductor elements and the peeling layer formed on the first substrate every crystalline semiconductor film.

14. An electro-optical device comprising the semiconductor device manufactured by using the method of manufacturing a semiconductor device according to Claim 1.

15. An integrated circuit comprising the semiconductor device manufactured by using the method of manufacturing a semiconductor device according to Claim 1.

16. A circuit board comprising the semiconductor device manufactured by using the method of manufacturing a semiconductor device according to Claim 1.

17. An electronic apparatus comprising the semiconductor device manufactured by using the method of manufacturing a semiconductor device according to Claim 1.